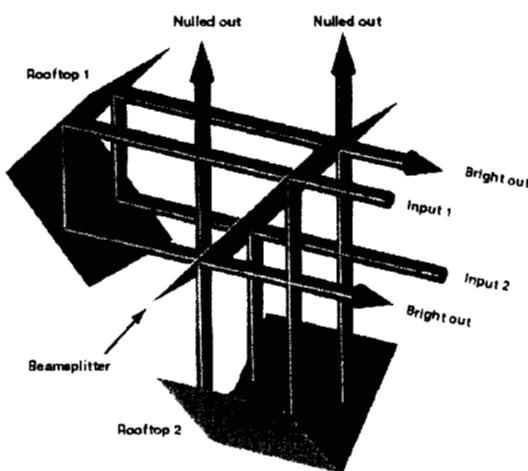


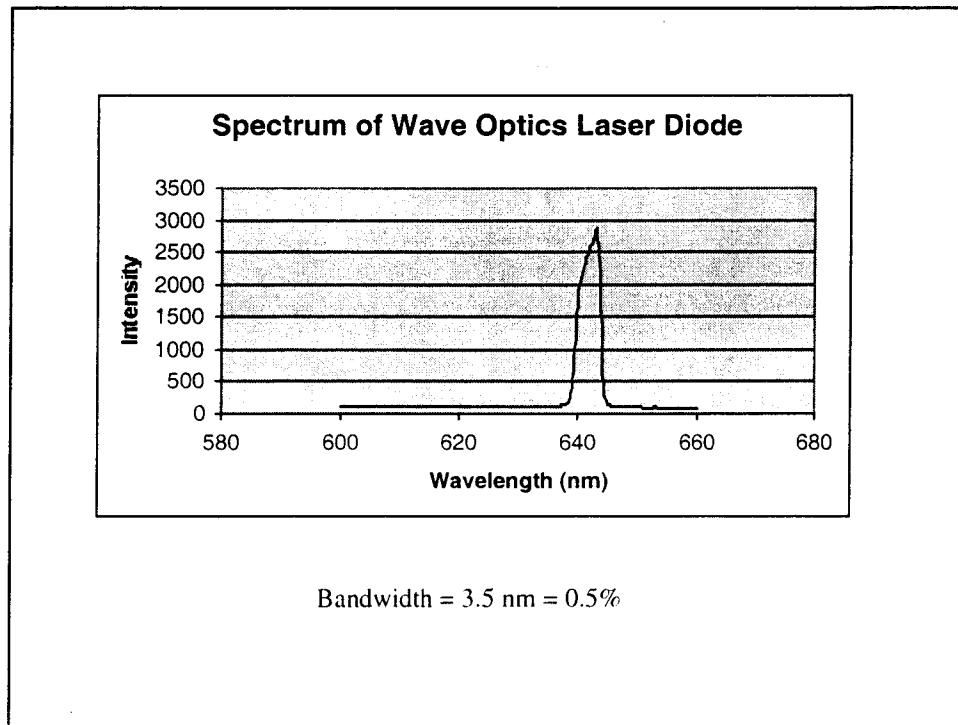
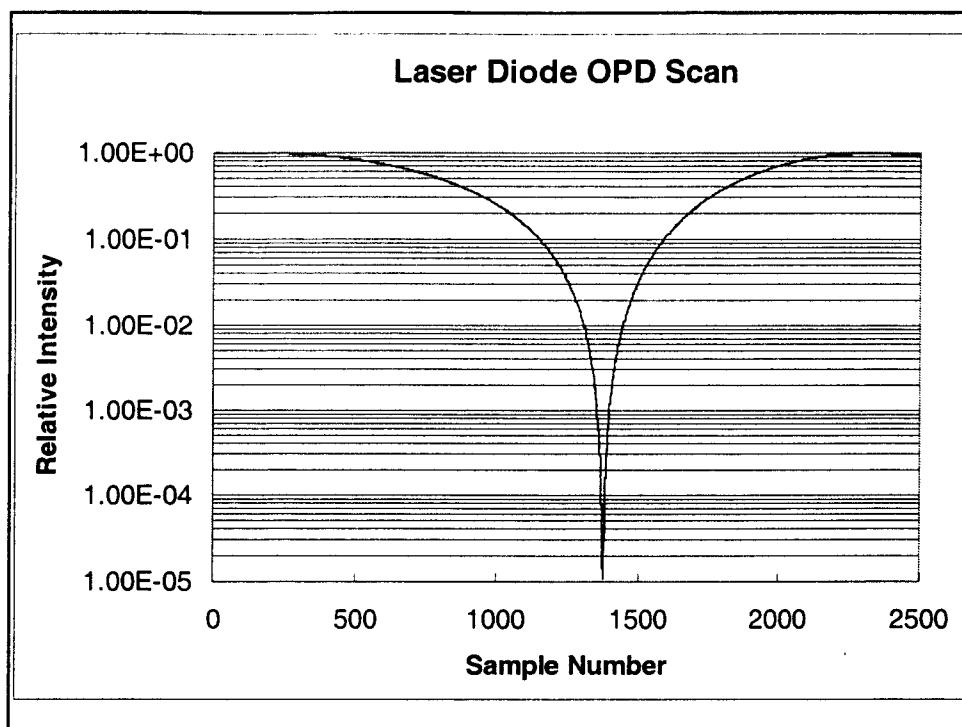
Experimental Confirmation of Deep Nulling

Darwin and Astronomy Conference
Stockholm, Sweden
November, 1999

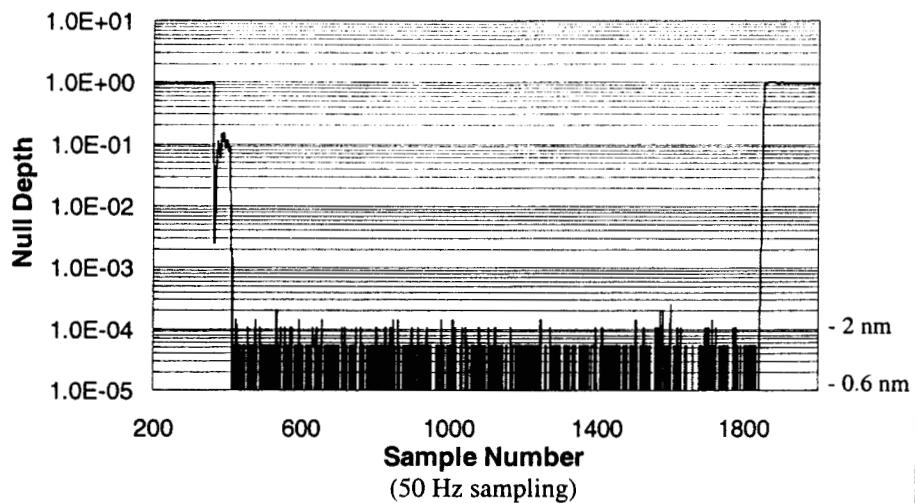
Gene Serabyn
JPL

Beam Combination in a Rotational Shearing Interferometer

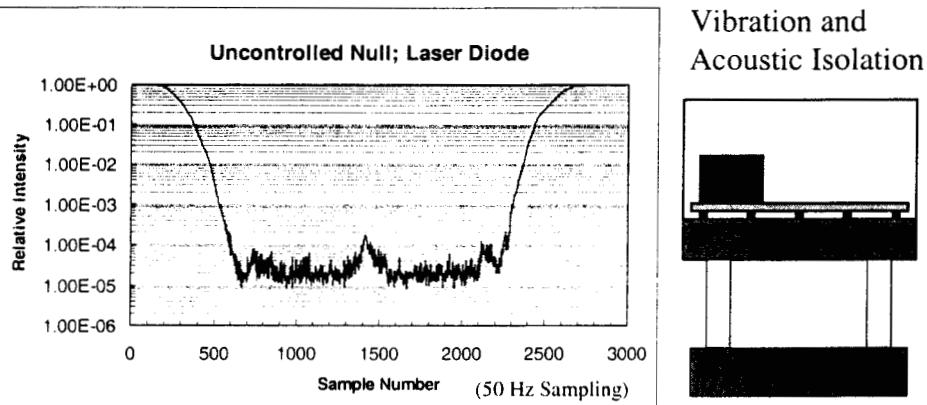


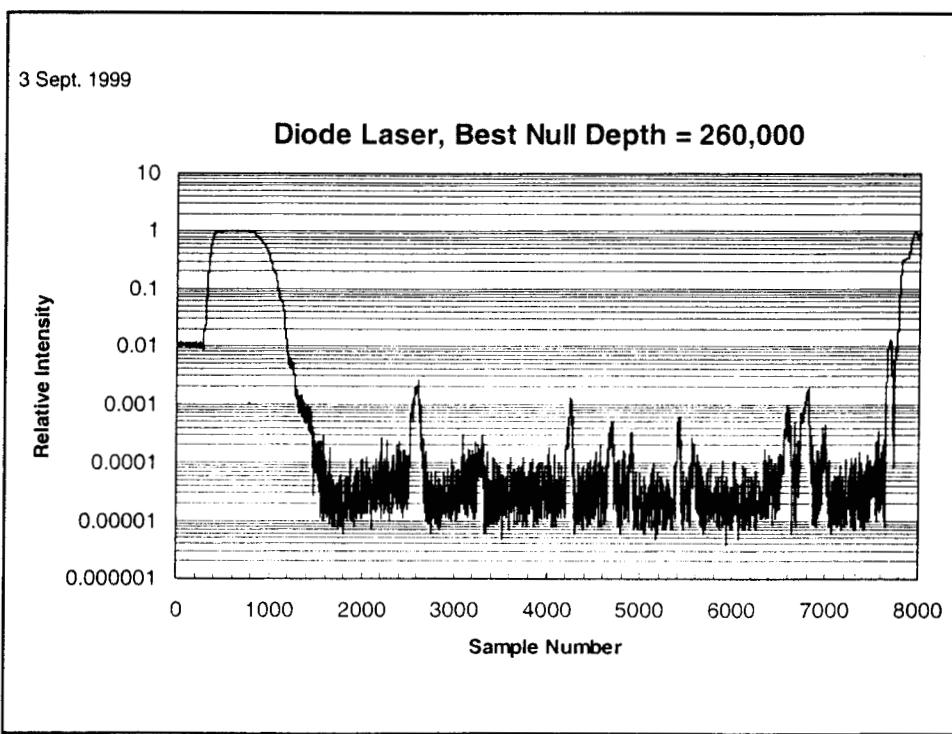
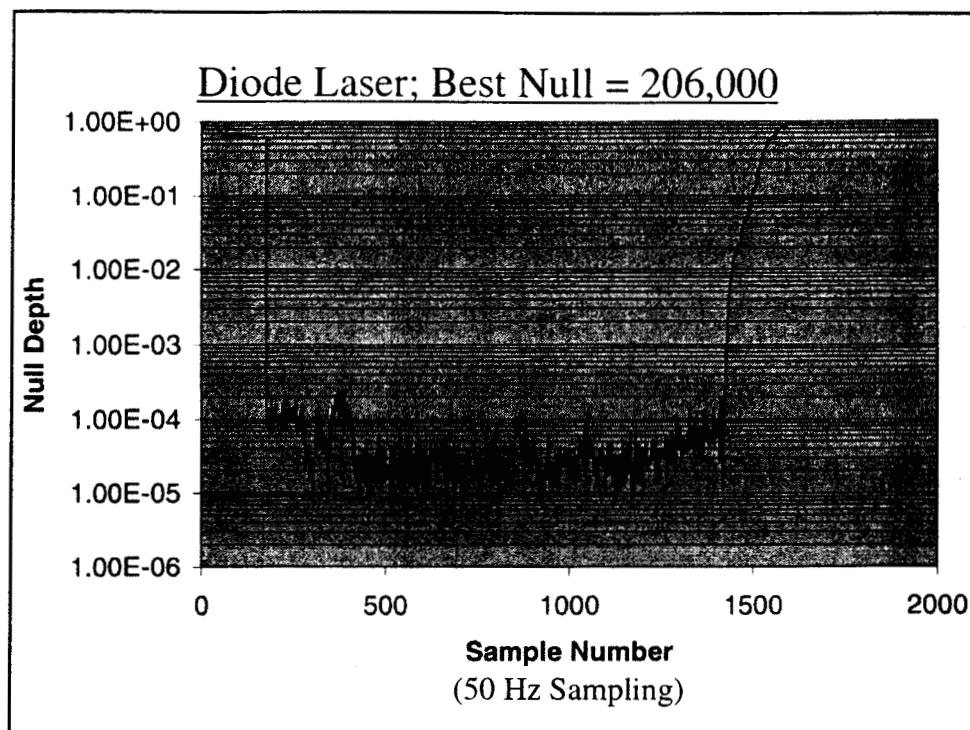


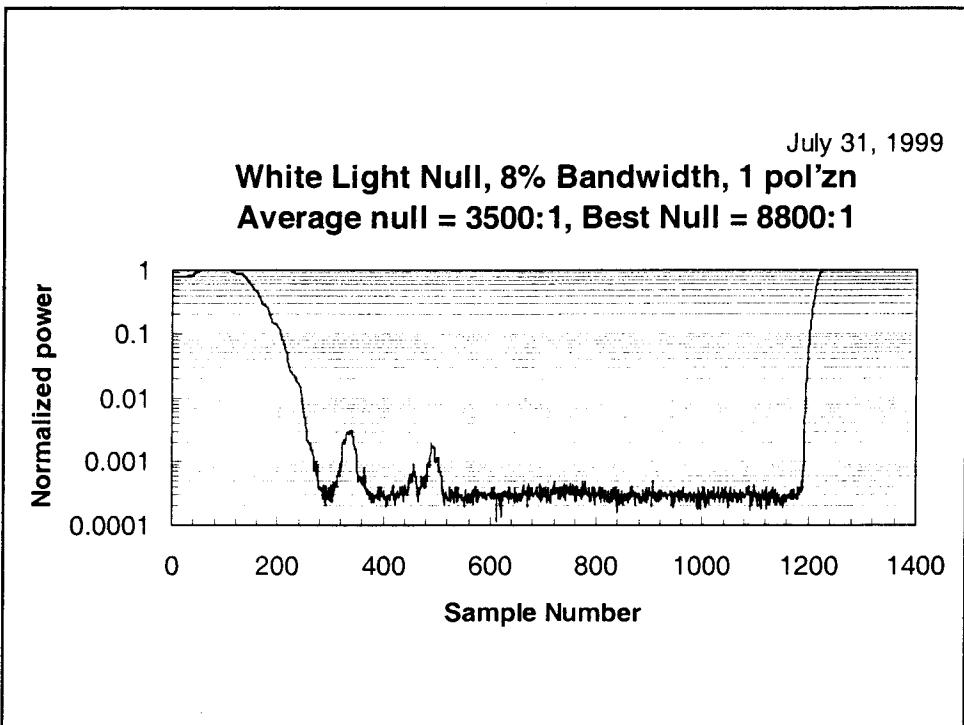
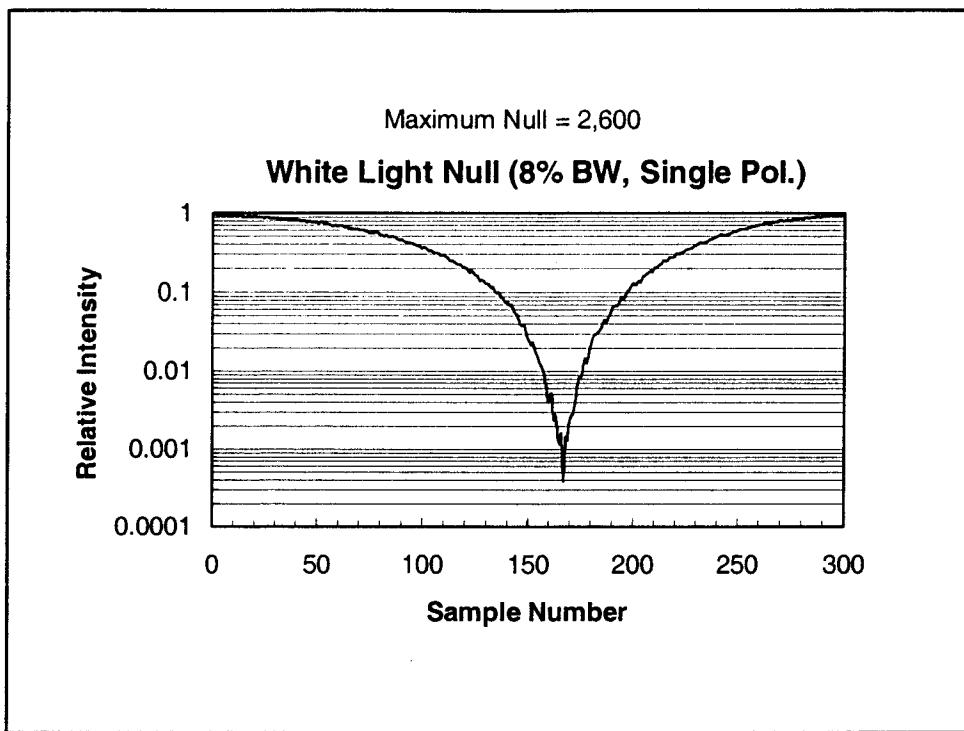
Dither-controlled Laser Null

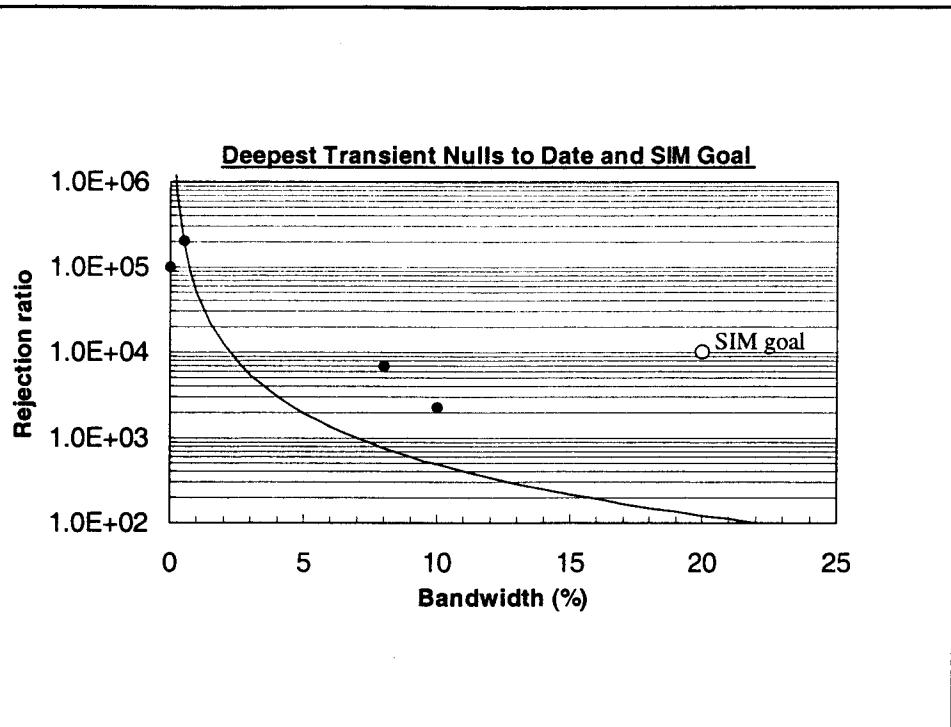


Environmental Improvements in New Lab:









Sources of null degradation for wider bands

- Input lens decenter
- Input polarizer wedge angle
- Beamsplitter/compensator thickness or rotation mismatch
- Beamsplitter/AR coating phase shifts
- Unequal number of AR coating traversals (BS/Comp)
- Mirror protective coating asymmetry
- Extra reflections in filters, polarizers
- Intensity balance vs. wavelength

Status

Laser diode (0.5% BW):

- Transient nulls during OPD fluctuations: 1/206,000
- Stable (average over 10 sec) null: 1/50,000
- Controlled null (peak over minute timescales): 1/10,000

Single-polarization, 8% BW white light:

- Stable (average over 5 sec) null: 1/3,500
- Best transient null (twice): 1/7,000

The Future: Control and Modulation Schemes

- Active Intensity Matching
- OPD Control:
 - Control one output by means of the second
 - Control one waveband by means of another
 - Control via metrology
- Signal Modulation Schemes:
 - Baseline rotation: fringes sweep across zodi/planet
 - Spatial chopping:
 - nulling removes star; chop on/off zodi/planet
 - OPD fringe scan after multiple baseline nulling

Future Work

- Broaden Bandwidth
- Move into Mid-Infrared (Cryogenic)
- Dual-polarization Nulling
- White-light Null stabilization
- Efficiency optimization
- Control architectures
- Component development (rooftops, beamsplitters, single-mode filters, AR coatings, etc.)
- Null at high altitude
- Null in space